Remarks

Applicant and the undersigned would like to thank the Examiner for his efforts in the examination of this application. Reconsideration is respectfully requested.

I. Rejection of Claims 6, 7, 32, and 33 under 35 USC 112

The Examiner has rejected Claims 6, 7, 32, and 33 under 35 USC 112, second paragraph, as being indefinite.

Claims 6, 7, 32, and 33 have been amended to incorporate the limitations of Claim 5 and 31, and are now dependent from Claims 1 and 28. No new matter has been entered thereby.

Claims 6, 7, 32, and 33 are now believed free from indefiniteness.

II. Rejection of Claims 1-10 and 14-16 under 35 USC 103(a)

The Examiner has rejected Claims 1-10 and 14-16 under 35 USC 103(a) as being unpatentable over Freeman (US 2,579,488) in view of Adee (US 4,743,740).

The rejection is respectfully traversed. Freeman teaches the use of dielectric heating to melt a plastic (e.g., PVC) spine extrusion (col. 1, lines 34-36, and col. 4, line 13) to bind a book. Dielectric heating is a very different phenomenon from resistive heating. In dielectric heating, a high-frequency voltage is applied to a sandwich consisting of two metal electrodes with plastic in the middle. The electrodes themselves are not heated. The high-frequency electric field causes dipoles within the plastic to oscillate, generating heat by friction. There is no net current flow longitudinally along the strip, as with resistive

heating. In independent Claim 1 is recited that the elongated strip has "an electrical resistivity between the ends" and that an introduced electrical current along the strip between the ends is "sufficient to heat the strip to a temperature at least as great as the melting temperature" of the adhesive. Thus the strip is subjected to resistive heating, direct current or low-frequency alternating current (e.g., 60 Hz) applied to the ends of the strip, so that current flows longitudinally along the strip.

The Examiner quotes from Freeman ". . . and means 51 for introducing an electrical current along the strip between the ends, the current sufficient to heat the strip . . ." (page 3, paragraph 5 of the Action). However, respectfully, Freeman inserts an aluminum electrode along the spine, as one part of the sandwich (Fig. 2, 31, and col. 3, lines 24-26), but current does not flow along the strip between the ends of this electrode sufficient to heat the strip (the + and - signs on the drawing of the electrode 31 are confusing). The electrodes are not heated in dielectric heating. Only the plastic is heated. Therefore, Freeman's aluminum electrode 31 is not a resistive strip that is heated by resistance heating.

It has been found as an unanticipated advantage of the present invention over Freeman that the exemplary aluminum foil strip with 1/8 inch-spaced very fine cuts has a resistance in the 0.5 to 0.7 ohm range, which allows the use of safe low voltages (typically, about 5 volts for the largest books), compared with the dangerous high-voltage resonant circuits necessary for powering dielectric heating (see Freeman, Fig. 2).

The Examiner uses Adee to supply the feature of the "substantially serpentine electrically conductive path between the ends" in Claim 1. The Examiner concludes on page 4 of the Action, "Therefore it would have been obvious to one having ordinary skill

in the art at the time the invention was made to have combined the elongated strip of Freeman with the serpentine shape of Adee in order to have a binding system that provides more even heating to the adhesive."

This application of the teachings of Adee is respectfully traversed. The purpose of the very fine cuts in the present invention as claimed is not to provide more even heating across the surface area to be heated, as suggested by the Examiner. Rather, the cuts provide a low-cost and practical way to raise the resistance of the aluminum strip from about 0.05 ohms to about 0.5 ohms, to provide a satisfactory impedance match to a power supply (see the instant Specification, page 7, line 19 to page 8, line 9). As evidence to support this point, in the case of the previous use of carbon fiber strips, which have a resistance of about 5 ohms, there was no need to provide cuts to provide more even heating to the adhesive in order to get satisfactory binding (Yeaple, US Patent 6,652,210, col. 4, lines 36-64).

In addition, Adee teaches the need to provide wide slots ("perforations") in the heating grid to admit air flow and sound waves to the honeycomb sound absorbing chambers beneath the heater (Adee, col. 2, lines 1-5, and Fig. 4). To understand the disadvantage of using such wide slots, one might envision laying a thin blanket of solid hot-melt adhesive over the grid shown in Fig. 3. The adhesive initially would melt over the conductors, but would not melt over the open slot areas. Thus it would take a long time to completely melt the adhesive. If one attempted to accelerate melting by raising the current, the adhesive over the conductors would char before the adhesive over the open slot areas melted.

In contrast, the present invention claims the use of cuts, which in a preferred embodiment are approximately typically 5 mils wide to ensure that the heating strip extends under virtually all of the solid adhesive. Because such a low applied voltage (approximately 5 volts end-to-end) is used, the cuts can be made very fine without the risk of current arcing over the cuts.

Also, the wide slots taught by Adee would allow too much of the melted adhesive to flow through and underneath the strip, reducing the thickness (65 mils ideal) of the melted adhesive needed to bind a page stack with irregular page edges.

With regard to the combination of Freeman and Adee, since there is no net current flow longitudinally along the plastic extrusion in Freeman's dielectric heating invention, it is not clear that adding wide slots as per Adee would have any beneficial effect. In fact, the removal of plastic binding material to create the wide slots might compromise the strength of the binding by leaving some areas of the page stack unattached to the inside of the spine of the cover.

If wide slots as taught by Adee were cut out of the strips of the present invention instead of the very fine cuts, heating of the adhesive would be uneven and too much of the melted adhesive would flow through the slots and underneath the strip. In this case, the heating of the strip would be slow and uneven, and the binding would lose strength due to the flow-through of the adhesive.

The invention claimed herein has been employed to successfully bind many books of all sizes, ranging from small 4- x 6-inch paperback children's books to luxurious 9 x 12 hardcover photo books and family history books bound in cloth and simulated leather.

Therefore, the invention as claimed herein is not taught by Freeman or Adee, alone or in combination, and it is respectfully believed that Claim 1 patentably defines thereover.

With regard to Claim 9, the Examiner states, "...the Examiner takes official notice that the tin or copper foil of Adee are well known equivalents for brass and aluminum foil in the art, and would be acceptable replacements for the purpose of design and/or manufacturing convenience." (Action, page 5, paragraph 13)

In the evolution of the present invention, originally carbon fiber was used (Yeaple, US Patent 6,652,210, col. 4, lines 36-64), but this material was too costly. For commercial success in the bookbinding business, a resistive strip material was needed that would cost pennies per book. Brass foil was tried and was effective, but was still too expensive. Surprisingly, it was found that ordinary 0.0005-inch thick kitchen aluminum foil would work equally well and meet the cost goal. There is no other metal foil commercially available in such large quantities at such a low cost. Therefore, aluminum foil is believed at the present time to be the material of choice for this application.

Subsequently an unanticipated advantage of aluminum foil over carbon fiber was discovered. For constant voltage input, the increase in resistance of aluminum with increasing temperature causes the applied current to decrease, automatically reducing the power (proportional to the square of the current) with increasing temperature. For example, the resistance of an experimental aluminum foil strip was found to increase from 0.425 ohms at 75°F to 0.615 ohms at 315°F. The temperature of the strip is thus self-limiting and reaches steady state without need for complex and costly controls, as previously known in the art.

A related unexpected advantage of aluminum foil was also found: the advantage of being able to measure the temperature of the heated strip inside the book by measuring the resistance change using the known coefficient for resistance change with temperature (0.00403/°Celsius for aluminum).

Therefore, Claims 1 and 9, and dependent Claims 2-10 and 14-16, are believed to patentably define over the cited art.

III. Rejection of Claims 28-36 and 40 under 35 USC 103(a)

The Examiner has rejected Claims 1-10 and 14-16 under 35 USC 103(a) as being unpatentable over Freeman (US 2,579,488) in view of Adee (US 4,743,740).

This rejection is respectfully traversed. The arguments against the application of Freeman and Adee have been made in §II above, and will not be repeated here, except to emphasize that neither Freeman nor Adee teaches an electrically resistive strip having adhesive applied thereto that is meltable with the application of resistive heating, nor the use of a strip having "spaced-apart cuts" therein.

Thus Claims 28-36 and 40 are respectfully believed to patentably define over Freeman and Adee, alone or in combination.

IV. Allowable Subject Matter

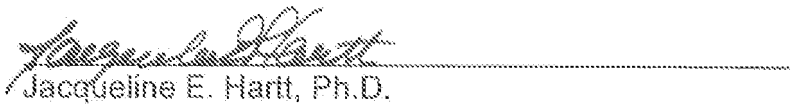
The Examiner has indicated Claims 17-27 to be allowable, and that Claims 11-13 and 37-39 contain allowable subject matter.

Applicant acknowledges this indication with appreciation.

Conclusions

Applicant respectfully submits that the above amendments place this application in a condition for allowance, and passage to issue is respectfully solicited. The Applicant and the undersigned would like to again thank the Examiner for his efforts in the examination of this application and for reconsideration of the claims as amended in light of the arguments presented. If the further prosecution of the application can be facilitated through telephone interview between the Examiner and the undersigned, the Examiner is requested to telephone the undersigned at the Examiner's convenience.

Respectfully submitted,



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